1) THE FOREIGN EXCHANGE AND MONEY MARKET MODEL

THE FOREIGN EXCHANGE MARKET

- Exchange rate: The price of one currency in terms of another
- Rate of return (RR)

(1) $RR_\$ = R_\$$ ← Expected depreciation

(2) $RR_€ = R_€ + \frac{E^e - E}{E}$

(3) $RR_\$ = RR_€$

- Endogenous: $RR_\$$, $RR_€$, E

Solving the model

- The uncovered interest parity condition (UIP)

$$R_\$ = R_€ + \frac{E^e - E}{E}$$

- The equilibrium exchange rate (from UIP)

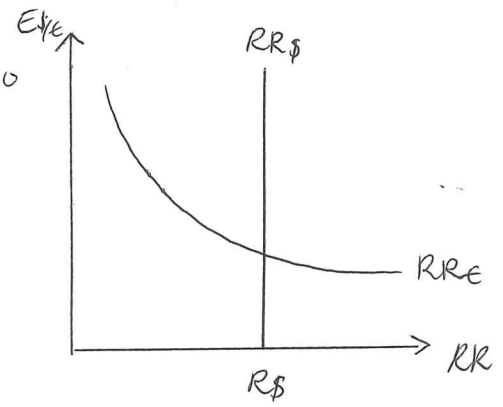
$$E = \frac{E^e}{1 + R_\$ - R_€}$$ → Find $\frac{\partial E}{\partial E^e} > 0$, $\frac{\partial E}{\partial R_\$} < 0$, $\frac{\partial E}{\partial R_€} > 0$

- Finding the $RR_€$ curve from (2)

$\frac{\partial RR_€}{\partial E} < 0$ and $\frac{\partial^2 RR_€}{\partial E} > 0$

→ Falling, convex curve

- Finding the $RR_\$$ curve from (1)



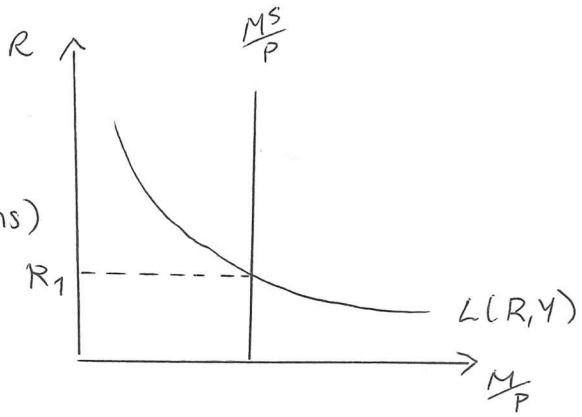
THE MONEY MARKET

- Money supply ($\frac{M^s}{P}$) is given by the central bank
- Money demand ($\frac{M^d}{P}$)

$M^d = P \cdot L(R, Y)$ (− on R, + on Y)

$$\Rightarrow \frac{M^d}{P} = L(R, Y)$$

- Equilibrium $M^s = M^d$ (for analytical solutions)
→ Equilibrium interest rate R_1

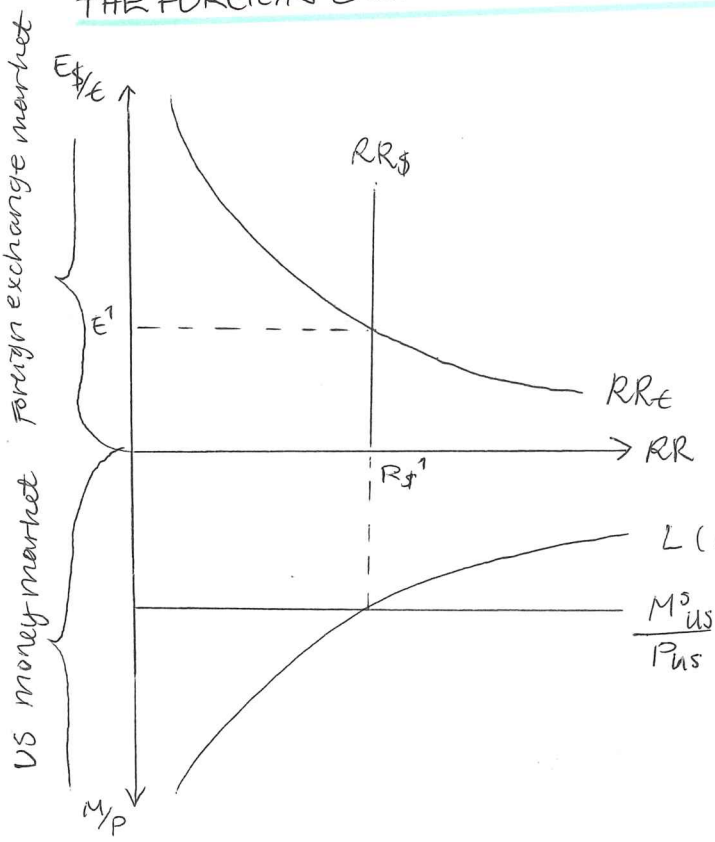


- Assume

$\frac{\partial M^d}{\partial R} < 0$, $\frac{\partial M^d}{\partial Y} > 0$, $\frac{\partial M^d}{\partial} > 0$

- The demand for and price of bonds ensures equilibrium

THE FOREIGN EXCHANGE AND MONEY MARKET MODEL



- Relationship between **money supply and inflation**

$$\frac{M^S}{P} = L(R, Y) \Rightarrow P = \frac{M^S}{L(R,Y)} \Rightarrow \frac{\Delta P}{P} = \frac{\Delta M^S}{M^S} - \frac{\Delta L}{L}$$

→ Assume that R and Y long run levels, so $\frac{\Delta L}{L} = 0$

$$\frac{\Delta P}{P} = \frac{\Delta M^S}{M^S}$$

→ Inflation and money supply growth are equal in the long run

- **Purchasing power parity** (PPP)

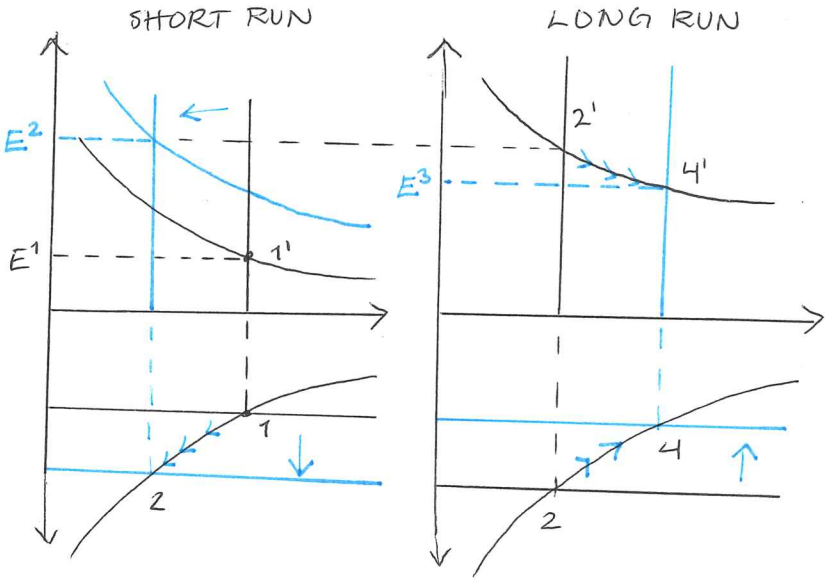
$$E_{\$/€} = \frac{P_{US}}{P_E}$$

→ If PPP: $P_{US} \uparrow \Rightarrow E^e_{\$/€} \uparrow$

- Short-run and long-run effects of a permanent increase in money supply
  - → **short run**: $M^S \uparrow$ and $E^e \uparrow$ (because $E^e \uparrow$ when permanent increase)
  - → **Long run**: Price level increases so M^S shifts back

- **Exchange rate overshooting**
  - → New equilibrium exchange rate is depreciated, but not as much as initially

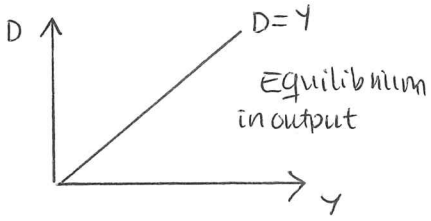
- Time paths of main variables
  - → M_{US}, $R_\$$, P_{US}, $E_{\$/€}$



2) THE AA-DD MODEL

DD-SCHEDULE : OUTPUT MARKET EQUILIBRIUM

- The DD schedule shows all combinations of output and the exchange rate where the output market is in equilibrium
- Finding the equation for aggregate demand:



Aggregate demand

$$D = C + I + G + CA$$

Consumption

$$C = C(Y-T)$$

+

Current account

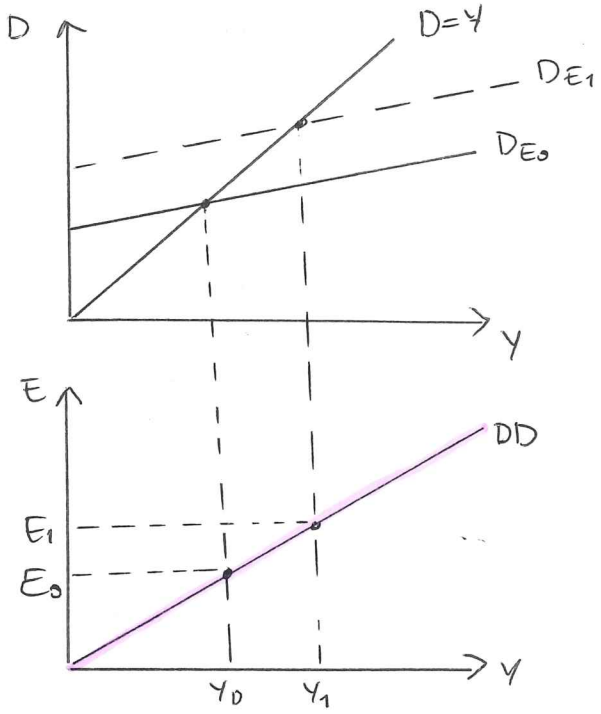
$$CA = CA\left(\frac{EP^*}{P}, Y-T\right)$$

(+, −)

↳ Marshall-Lerner

$$\Rightarrow Y = C(Y-T) + I + G + CA\left(\frac{EP^*}{P}, Y-T\right)$$

$$\Rightarrow D = D\left(\frac{EP^*}{P}, Y-T, I, G\right)$$



- We find the DD schedule by imagining E↑, from E_0 to E_1 (assume P and P* fixed)
  → Mechanism: $E\uparrow \Rightarrow \frac{EP^*}{P}\uparrow \Rightarrow CA\uparrow \Rightarrow Y\uparrow$
- Outward shift: G↑, T↓, I↑, P↓, P*↑

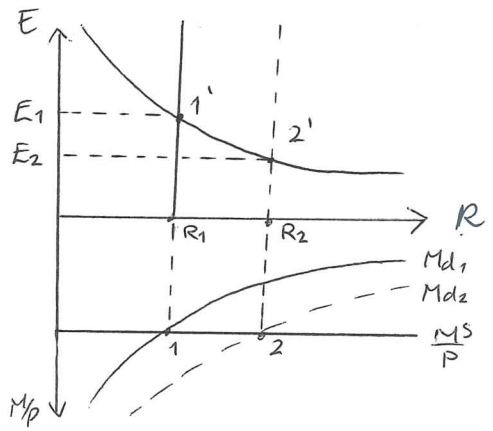
AA-SCHEDULE : ASSET MARKET EQUILIBRIUM

- The AA schedule shows all combinations of output and the exchange rate where the domestic money market and the foreign exchange market are in equilibrium
- The money market equilibrium

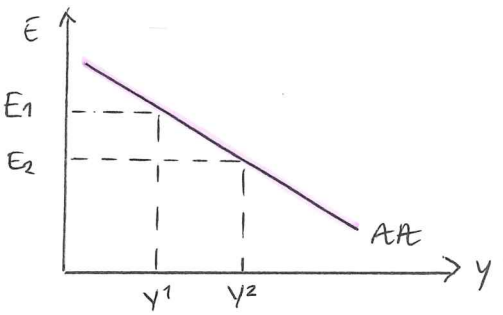
$$\frac{M^S}{P} = L(R, Y)$$

- The foreign exchange market equilibrium

$$R = R^* + \frac{E^e - E}{E}$$



- We find the AA schedule by imagining Y↑, from Y^1 to Y^2
  → Mechanism: $Y\uparrow \Rightarrow M^d\uparrow \Rightarrow R\uparrow \Rightarrow E\downarrow$
- Outward shift: $M^S\uparrow$, P↓, $E^e\uparrow$, $R^*\uparrow$



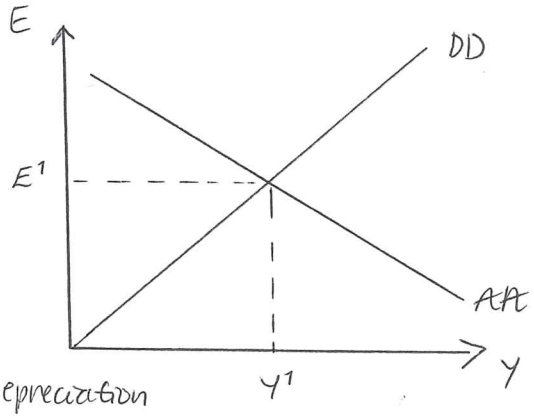
THE AA-DD MODEL

(1) $Y = C(Y-T) + I + G + CA(\frac{EP^*}{P}, Y-T)$

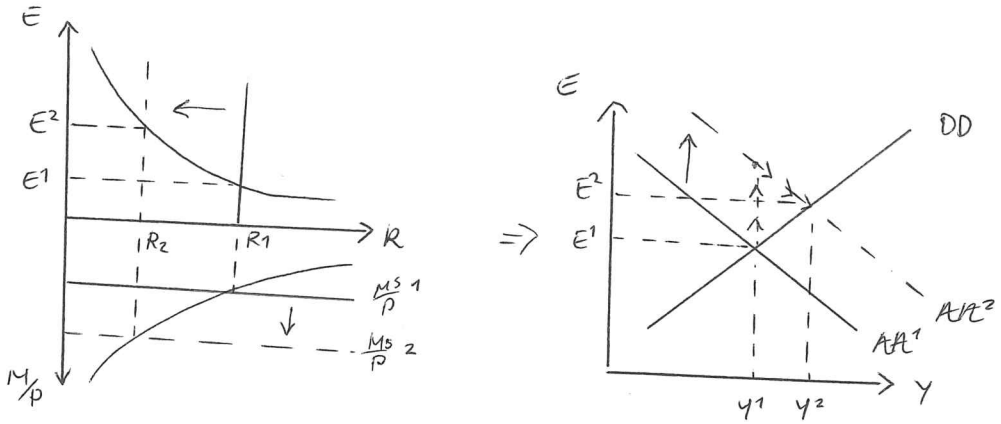
(2) $\frac{M^S}{P} = L(R, Y)$

(3) $R = R^* + \frac{E^e - E}{E}$

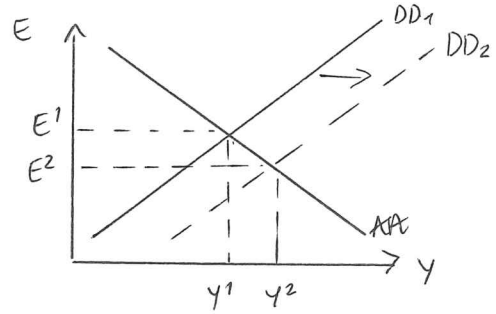
- Endogenous: Y, R, E



- Expansionary monetary policy, $M^S \uparrow$: currency depreciation
  → Higher E for given Y in AA

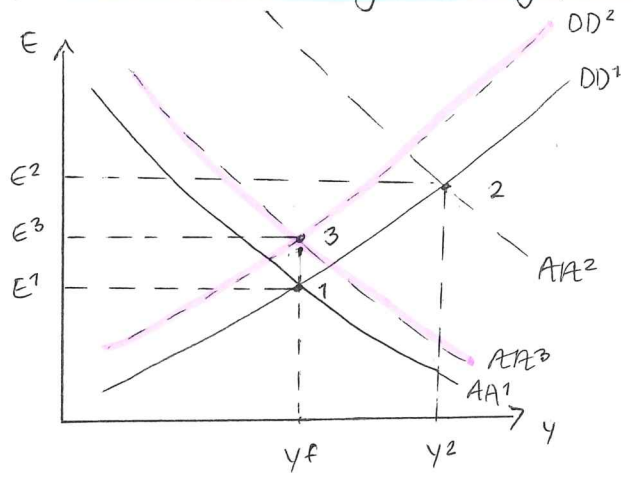


- Expansionary fiscal policy, $G \uparrow$: currency appreciation
  → Higher Y for given E in DD



- Fiscal vs. monetary policy: different effect on the current account
  → Monetary: $M^S \uparrow \Rightarrow R \downarrow \Rightarrow E \uparrow \Rightarrow CA \uparrow$
  → Fiscal: $G \uparrow \Rightarrow Y \uparrow \Rightarrow M^d \uparrow \Rightarrow R \uparrow \Rightarrow E \downarrow \Rightarrow CA \downarrow$
- The liquidity trap: $R = 0$
  → Monetary policy does not work

- Permanent expansionary monetary policy, $M^S \uparrow$



→ First: AA shifts upwards ($E^e \uparrow$)

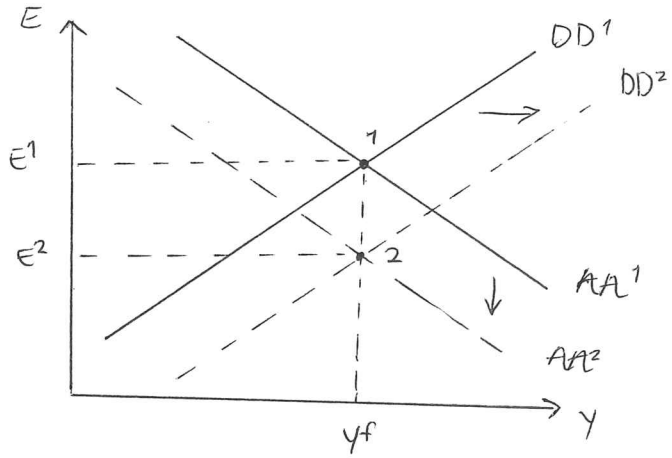
→ Long run: $P \uparrow$

DD: $\frac{\in P^*}{P} \downarrow$ ⇒ CA ↓ ⇒ Y ↓ (shift left)

AA: $\frac{M^S}{P} \downarrow$ ⇒ R ↑ ⇒ $\in$ ↓ (shift down)

($E^3 > E^1$ because E^e has increased)

- Permanent expansionary fiscal policy, G ↑



→ DD shifts right

→ AA immediately shifts down because ($E^e \downarrow$)

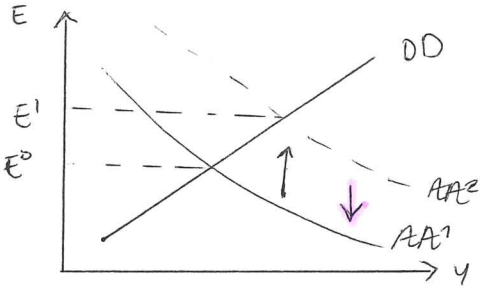
(E^2 is both short and long run equilibrium)

- Foreign exchange interventions: The central bank buys or sells foreign assets to affect its exchange rate (when fixed exchange rate to defend)

AA ↓ → Selling foreign assets (→ pressure for depreciation) ⇒ Decreased money supply

AA ↑ → Buying foreign assets (→ pressure for appreciation) ⇒ Increased money supply

- Monetary policy with fixed exchange rate

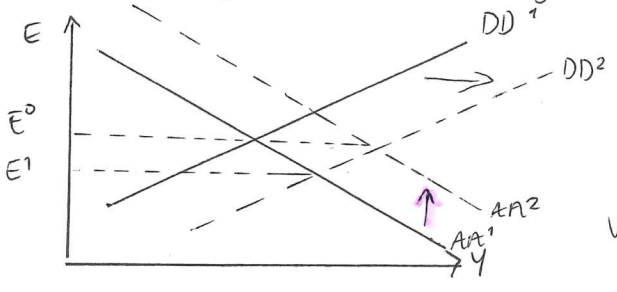


→ First: Monetary policy (AA upwards)

→ Then: Must sell foreign assets to keep $E = E^\circ$ (AA shifts back)

Monetary policy does not work

- Fiscal policy with fixed exchange rate



→ First: Fiscal policy (DD right)

→ Then: Must buy foreign assets to keep $E = E^\circ$ (AA shifts up)

Works, but we need sufficient reserves

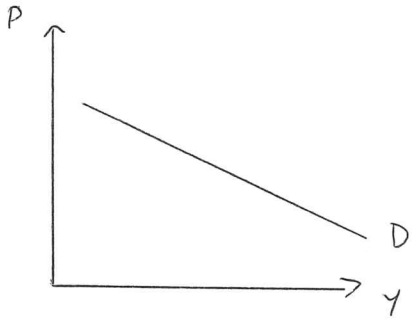
3) MUNDELL'S MODEL FOR OPTIMAL CURRENCY AREAS (OCA)

- Monetary union
  - → common currency
  - → comman centeal bank
- A country in a monetary union is not able to:
  - → Devaluate / revaluate its currency
  - → Determine the quantity of national money in circulation
  - → Change the short term interest rate

AGGREGATE DEMAND - AGGREGATE SUPPLY MODEL

- How to handle asymmetric shocks?
- Automatic adjustments
  - → Wage flexibility
  - → Labor mobility
- Economic policies
  - → Monetary policy
  - → Fiscal policy
- Demand curve

$$Y = F\left(\frac{M}{P}, G, T, \frac{EP^*}{P}, \alpha\right)$$
$$\quad\quad + \quad + \quad - \quad + \quad +$$



- Mechanism
  1) $P\uparrow \Rightarrow \frac{EP^*}{P}\downarrow \Rightarrow$ Net exports $\downarrow \Rightarrow Y\downarrow$
  2) $P\uparrow \Rightarrow \frac{M}{P}\downarrow \Rightarrow$ Interest rate $\uparrow \Rightarrow$ Investment $\downarrow \Rightarrow Y\downarrow$
- Outward shift

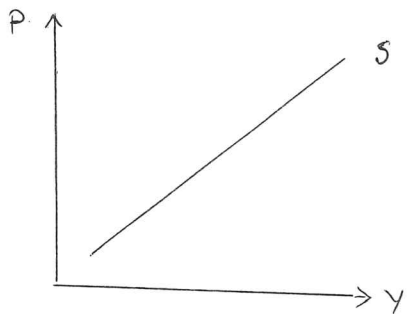
$M\uparrow$	$G\uparrow, T\downarrow$	$E\uparrow, P^*\uparrow$	$\alpha\uparrow$
Expansionary monetary politics	Expansionary fiscal policy	Real exchange rate depreciation	Demand shock

- Supply curve

$$Y = G\left(\frac{W}{P}, \beta\right)$$
$$\quad\quad - \quad +$$

$\frac{W}{P}$ – real wage

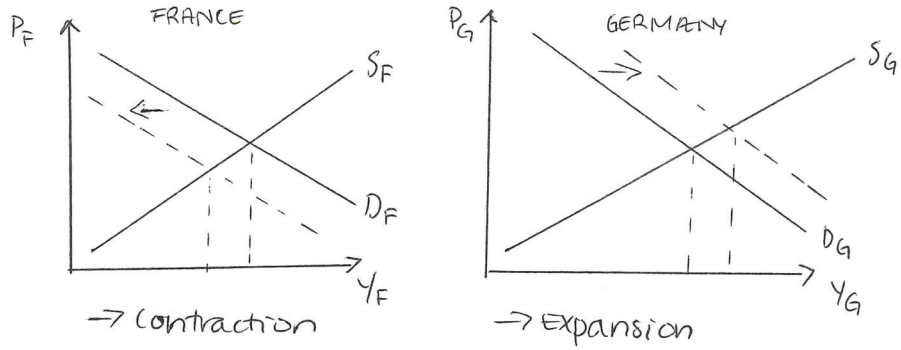
β – supply shock



- Mechanism: $P\uparrow \Rightarrow \frac{W}{P}\downarrow \Rightarrow Y\uparrow$
- Outward shift: $W\downarrow, \beta\uparrow$

ASYMMETRIC SHOCKS IN A MONETARY UNION

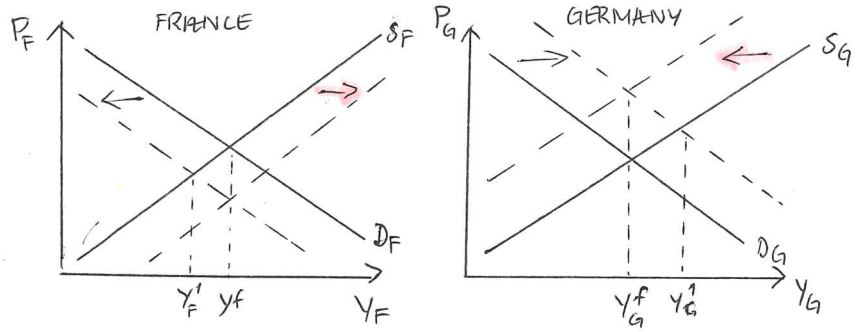
- Asymmetric shock in aggregate demand



→ Contraction → Expansion

Automatic adjustments

- **Wage flexibility**
  - → France: Unemployment ⇒ Reduced wage claims ⇒ Positive supply shifts
  - → Germany: Pressure in labour markets ⇒ Wages are pushed up ⇒ Negative supply shift

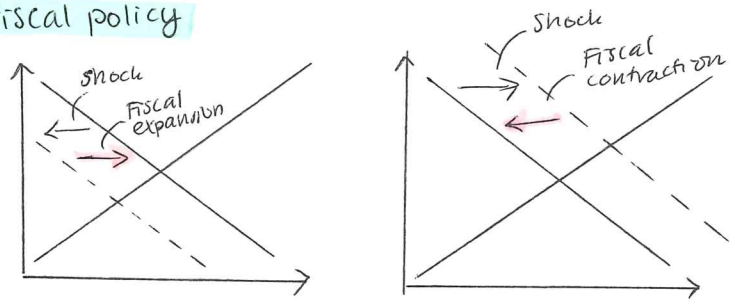


→ Higher wages/prices → lower wages/prices

- **Labor mobility**
  - → Unemployed workers in France move to Germany

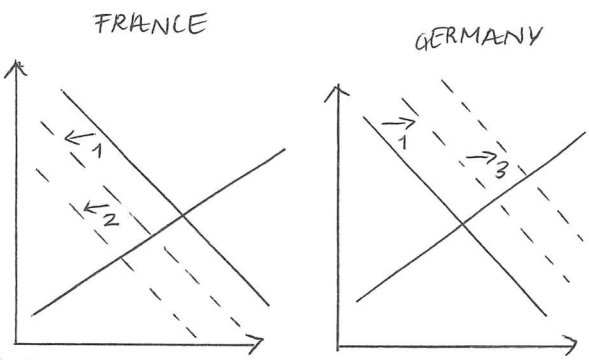
Economic policies

- **Monetary policy**
  - → France needs expansion, Germany needs restriction ⇒ Does not work
- **Fiscal policy**



Debt dynamics

1) Asymmetric shocks
2) French budget deficit increase
   → Capital outflow, interest rate ↑
3) Capital inflow to Germany
   → interest rate ↓



- Initial shocks are strengthened by the debt crisis in France

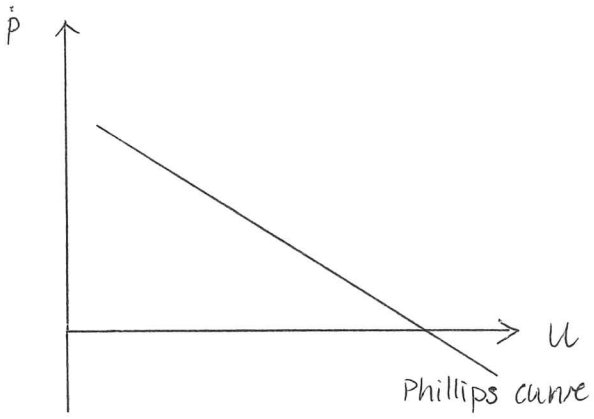
4) THE BARRO-GORDON MODEL

EXPECTATIONS-AUGMENTED PHILLIPS CURVE

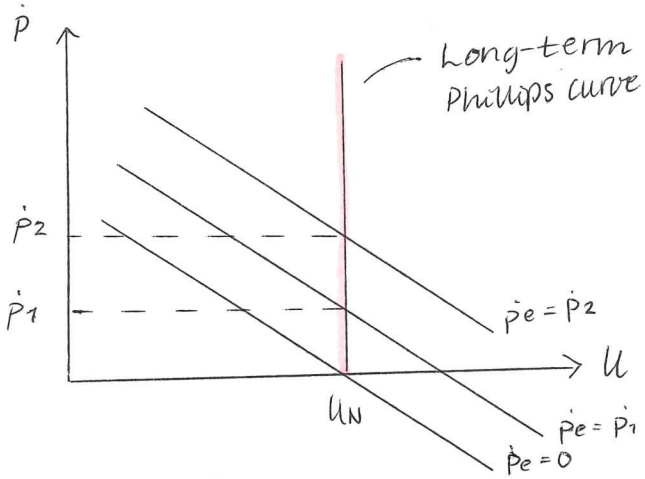
- Phillips curve

$$\dot{p} = \dot{p}^e - \frac{1}{a}(u - u_N)$$

u - unemployment rate
u_N - natural rate of u
$\dot{p}$ - inflation
$\dot{p}^e$ - expected inflation



- Trade off between inflation and unemployment
  → $u \downarrow \Rightarrow w \uparrow \Rightarrow p \uparrow \Rightarrow \dot{p} \uparrow$
- Long-term Phillips curve
  → Rational expectations: $u = u_N \Rightarrow \dot{p} = \dot{p}^e$

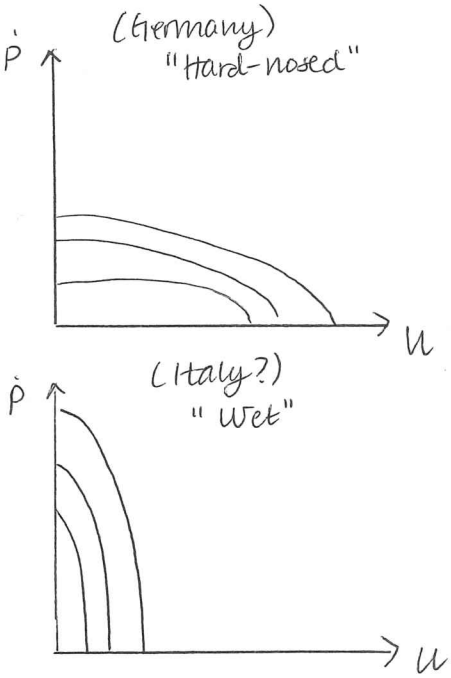


PREFERENCES OF THE MONETARY AUTHORITIES

- Welfare function of government

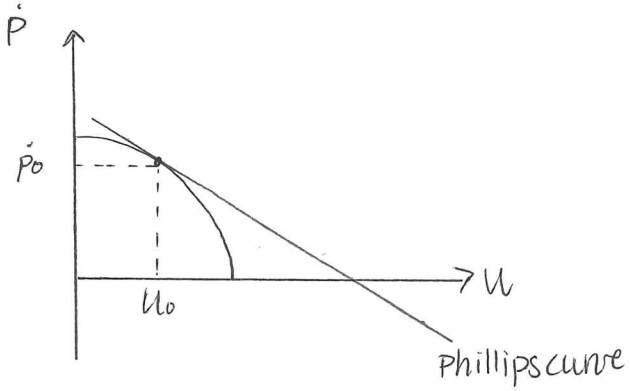
$$V = V(u, \dot{p})$$

- Closer to origin → lower welfare loss
- "Hard-nosed" government: care relatively more about inflation
- "Wet" government: care relatively more about unemployment



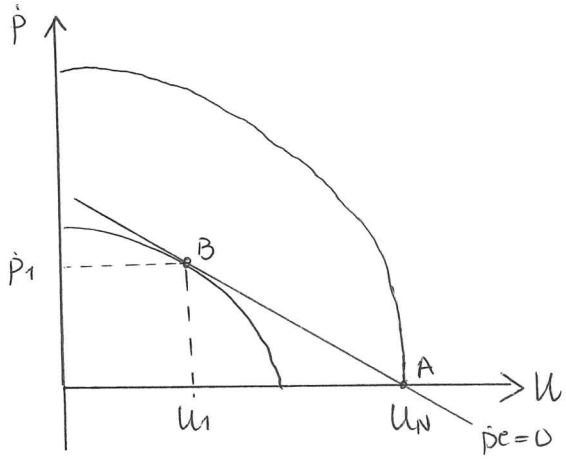
SHORT RUN EQUILIBRIUM

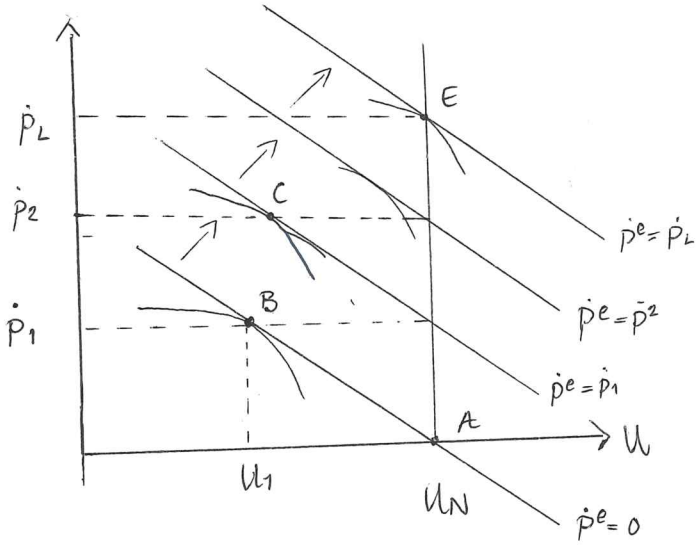
- Lowest indifference curve given the Phillips curve
  → sets $\dot{p}_0$ with interest rate, gets u_0



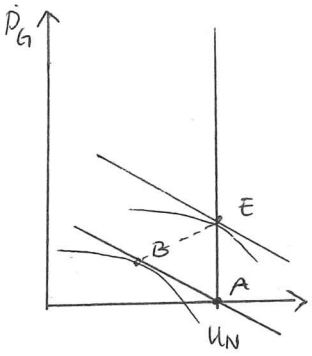
LONG RUN EQUILIBRIUM

- Start in A with $\dot{p}^* = 0$
  → The monetary policy is credible, so $\dot{p}^e = 0$
- Incentive to generate surprise inflation
  → Reach B with higher utility
- Over time, inflation expectations are adjusted upwards
  → B → C → → E (long run equilibrium)
  → This process is called **stagflation**

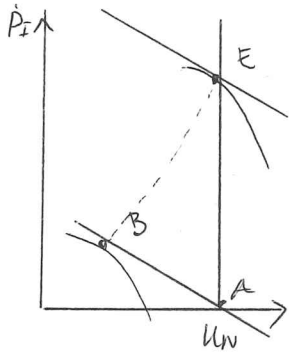




"Hard-nosed" (Germany)



"Wet" (Italy)



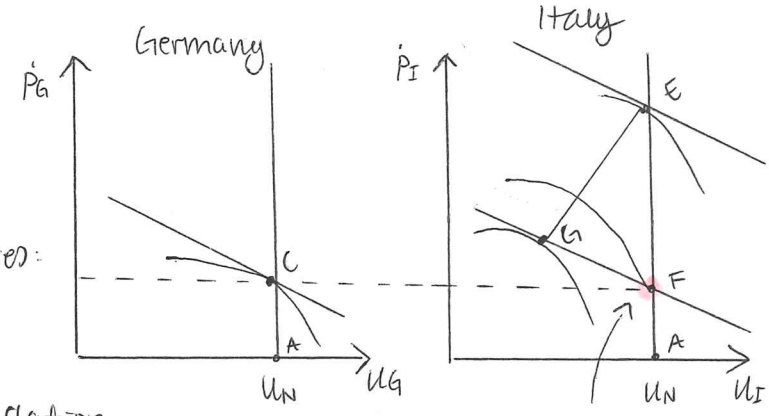
- The equilibrium level of inflation depends on the preferences of the authorities
  → Italy has high preference for low unemployment, but ends up with u_N and high inflation
  $\dot{E} = \dot{P}_I - \dot{P}_G$ => Depreciation of the Italian currency

SOLUTION: MONETARY UNION WITH SAME CURRENCY

- Control high inflation in countries with wet governments and unstable exchange rates
- Italy will convince citizens that point F is credible
- Issue: central bank represented by both preferences:

  $\Rightarrow \dot{P}_G < \dot{P}_{union} < \dot{P}_I$

- Low inflation country loses welfare, high inflation country gains welfare



Credible if monetary union